Complete Summary

GUIDELINE TITLE

Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure.

BIBLIOGRAPHIC SOURCE(S)

Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, Jones DW, Materson BJ, Oparil S, Wright JT Jr, Roccella EJ. Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Hypertension 2003 Dec;42(6):1206-52. [386 references] PubMed

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: The Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure. Bethesda (MD): U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Heart, Lung and Blood Institute; 1997 Nov. 33 p.

** REGULATORY ALERT **

FDA WARNING/REGULATORY ALERT

Note from the National Guideline Clearinghouse: This guideline references a drug(s) for which important revised regulatory information has been released.

- October 18, 2007, PDE5 inhibitors, Viagra (sildenafil citrate), Levitra (vardenafil HCL), Cialis (tadalafil): The PRECAUTION and updated Adverse Reactions Sections of the approved product labeling for Viagra, Levitra, and Cialis were revised in response to reports of sudden decreases or loss of hearing.

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Hypertension

GUIDELINE CATEGORY

Diagnosis
Evaluation
Management
Prevention
Treatment

CLINICAL SPECIALTY

Family Practice
Internal Medicine
Pediatrics

INTENDED USERS

Advanced Practice Nurses
Nurses
Pharmacists
Physician Assistants
Physicians
Public Health Departments

GUIDELINE OBJECTIVE(S)

To increase awareness, prevention, treatment, and control of hypertension by:

- Updating the previous guideline (The Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure. Bethesda [MD]: U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Heart, Lung, and Blood Institute; 1997 Nov.)
- Reviewing hypertension observational studies and clinical trials that were published after the JNC 6 report was developed
- Providing a new clear and concise guideline that is useful for clinicians
- Simplifying the classification of blood pressure
- Providing a means by which the Joint National Committee reports may be used to their maximum benefit

TARGET POPULATION

- Adults age 18 and older with:
    - Prehypertension (Systolic blood pressure [SBP] 120–139mm Hg/Diastolic blood pressure [DBP] 80–89 mm Hg)
    - Stage 1 hypertension (SBP 140–159 mm Hg/DBP 90–99 mm Hg)
    - Stage 2 hypertension (SBP $\geq$160 mm Hg/DBP $\geq$100 mm Hg)
- Children and adolescents with blood pressure that is, on repeated measurement, at the 95th percentile or greater adjusted for age, height, and sex

INTERVENTIONS AND PRACTICES CONSIDERED

Evaluation/Diagnosis

1. Blood pressure measurements, in the physician's office using the auscultatory method with a calibrated instrument and appropriate cuff size, via ambulatory blood pressure monitoring, or by self-measurement
2. Medical history and physical examination
3. Laboratory tests, including electrocardiogram; urinalysis; blood glucose and hematocrit; serum potassium, creatinine (or the corresponding estimated glomerular filtration rate), and calcium; and a lipid profile. Optional tests include measurement of urinary albumin excretion or albumin/creatinine ratio.

Prevention/Treatment

1. Lifestyle modification, including weight loss, dietary modification, dietary sodium reduction, increased physical activity, and moderation of alcohol consumption
2. Pharmacological treatment, including:
    - angiotensin converting enzyme inhibitors (ACEIs)
    - angiotensin receptor blockers (ARBs)
    - beta blockers (BBs)
    - calcium channel blockers (CCBs)
    - thiazide-type diuretics
    - combination drugs, such as ACEIs and CCBs, ACEIs and diuretics, ARBs and diuretics, BBs and diuretics, centrally acting drug and diuretic, and diuretic and diuretic

Management

1. Follow-up visits
2. Adjustment of medication
3. Monitoring serum potassium and creatinine
4. Vigorous promotion of tobacco avoidance
5. Low-dose aspirin therapy when blood pressure is controlled

MAJOR OUTCOMES CONSIDERED

- Blood pressure measurements (systolic and diastolic)

- Incidence of cardiovascular disease, stroke, myocardial infarction, renal failure, and other conditions associated with hypertension
- Cardiovascular risk
- Morbidity and mortality associated with cardiovascular and renal complications of hypertension

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Based on critical issues and concepts that emerged after the publication of the Sixth Report of the Joint National Committee (JNC 6), the Executive Committee identified relevant Medical Subject Headings (MeSH) terms and keywords to review the scientific literature. These MeSH terms were used to generate MEDLINE searches that focused on English language peer-reviewed scientific literature from January 1997 through April 2003.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Expert Consensus (Committee)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

METHODS USED TO ANALYZE THE EVIDENCE

Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus (Nominal Group Technique)

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

The Executive Committee met on six occasions, two of which included meetings with the entire High Blood Pressure Education Program (NHBPEP) Coordinating Committee (CC). The writing teams also met by teleconference and used electronic communications to develop the report. Twenty-four drafts were created and reviewed in a reiterative fashion. At its meetings, the Executive Committee used a modified nominal group process to identify and resolve issues.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

External Peer Review
Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

The National High Blood Pressure Education Program Coordinating Committee (NHBPEP CC) reviewed the penultimate draft of the guideline and provided written comments to the Executive Committee. In addition, 33 national hypertension leaders reviewed and commented on the document. The NHBPEP CC approved the Joint National Committee 7 report.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Key Messages

- In persons older than 50 years, systolic blood pressure greater than 140 mmHg is a much more important cardiovascular disease (CVD) risk factor than diastolic blood pressure.
- The risk of CVD beginning at 115/75 mmHg doubles with each increment of 20/10 mmHg; individuals who are normotensive at age 55 have a 90 percent lifetime risk for developing hypertension.
- Individuals with a systolic blood pressure of 120–139 mmHg or a diastolic blood pressure of 80–89 mmHg should be considered as prehypertensive and require health-promoting lifestyle modifications to prevent CVD.
- Thiazide-type diuretics should be used in drug treatment for most patients with uncomplicated hypertension, either alone or combined with drugs from other classes. Certain high-risk conditions are compelling indications for the initial use of other antihypertensive drug classes (angiotensin converting enzyme inhibitors, angiotensin receptor blockers, beta-blockers, calcium channel blockers).

- Most patients with hypertension will require two or more antihypertensive medications to achieve goal blood pressure (<140/90 mmHg, or <130/80 mmHg for patients with diabetes or chronic kidney disease).
- If blood pressure is >20/10 mmHg above goal blood pressure, consideration should be given to initiating therapy with two agents, one of which usually should be a thiazide-type diuretic.
- The most effective therapy prescribed by the most careful clinician will control hypertension only if patients are motivated. Motivation improves when patients have positive experiences with, and trust in, the clinician. Empathy builds trust and is a potent motivator.

Classification of Blood Pressure

The table below provides a classification of blood pressure (BP) for adults ages 18 and older. The classification is based on the average of two or more properly measured, seated BP readings on each of two or more office visits. In contrast to the classification provided in the Sixth Report of the Joint National Committee on Blood Pressure (JNC 6), a new category designated prehypertension has been added, and stages 2 and 3 hypertension have been combined. Patients with prehypertension are at increased risk for progression to hypertension; those in the 130–139/80-89 mmHg BP range are at twice the risk to develop hypertension as those with lower values.

Table. Classification and Management of Blood Pressure for Adults Aged 18 Years or Older

				Management*		
					Initial Drug Therapy	
BP Classification	**Systolic BP, mm Hg***		**Diastolic BP, mm Hg***	**Lifestyle Modification**	**Without Compelling Indication**	**With Compelling Indications****
Normal	<120	and	<80	Encourage		
Prehypertension	120-139	or	80-89	Yes	No antihypertensive drug indicated	Drug(s) for the compelling indications***
Stage 1 hypertension	140-159	or	90-99	Yes	Thiazide-type diuretics for most; may consider ACE inhibitor, ARB, beta-blocker, CCB, or combination	Drug(s) for the compelling indications Other antihypertensive drugs (diuretics, ACE inhibitor, ARB, beta-blocker, CCB) as needed
Stage 2	≥160	or	≥100	Yes	2-Drug	Drug(s) for the

				Management*		
					Initial Drug Therapy	
BP Classification	**Systolic BP, mm Hg***		**Diastolic BP, mm Hg***	**Lifestyle Modification**	**Without Compelling Indication**	**With Compelling Indications****
hypertension					combination for most (usually thiazide-type diuretic and ACE inhibitor or ARB or beta-blocker or CCB)****	compelling indications Other antihypertensive drugs (diuretics, ACE inhibitor, ARB, beta-blocker, CCB) as needed

Abbreviations: ACE, angiotensin-converting enzyme; ARB, angiotensin-receptor blocker, BP, blood pressure; CCB, calcium channel blocker
* Treatment determined by highest BP category.
** See Table 6. *** Treat patients with chronic kidney disease or diabetes to BP goal of less than 130/80 mm Hg.
**** Initial combined therapy should be used cautiously in those at risk for orthostatic hypotension.

Public Health Challenges and Community Programs

Public health approaches, such as reducing calories, saturated fat, and salt in processed foods and increasing community/school opportunities for physical activity, can achieve a downward shift in the distribution of a population's BP, thus potentially reducing morbidity, mortality, and the lifetime risk of an individual's becoming hypertensive. This becomes especially critical as the increase in body mass index (BMI) of Americans has reached epidemic levels. Now, 122 million adults are overweight or obese, which contributes to the rise in BP and related conditions. The Seventh Report of the Joint National Committee endorses the American Public Health Association resolution that the food manufacturers and restaurants reduce sodium in the food supply by 50 percent over the next decade. When public health intervention strategies address the diversity of racial, ethnic, cultural, linguistic, religious, and social factors in the delivery of their services, the likelihood of their acceptance by the community increases. These public health approaches can provide an attractive opportunity to interrupt and prevent the continuing costly cycle of managing hypertension and its complications.

Blood Pressure (BP) Measurement

- **In the Physician's Office**: The auscultatory method of BP measurement with a properly calibrated and validated instrument should be used. Persons should be seated quietly for at least 5 minutes in a chair (rather than on an exam table), with feet on the floor, and arm supported at heart level. Measurement of BP in the standing position is indicated periodically, especially

in those at risk for postural hypotension. An appropriate-sized cuff (cuff bladder encircling at least 80 percent of the arm) should be used to ensure accuracy. At least two measurements should be made. Systolic blood pressure (SBP) is the point at which the first of two or more sounds is heard (phase 1), and diastolic blood pressure (DBP) is the point before the disappearance of sounds (phase 5). Clinicians should provide to patients, verbally and in writing, their specific BP numbers and BP goals.

- **Ambulatory BP monitoring**: Ambulatory blood pressure monitoring (ABPM) provides information about BP during daily activities and sleep. ABPM is warranted for evaluation of "white-coat" hypertension in the absence of target organ injury. It is also helpful to assess patients with apparent drug resistance, hypotensive symptoms with antihypertensive medications, episodic hypertension, and autonomic dysfunction. The ambulatory BP values are usually lower than clinic readings. Awake, individuals with hypertension have an average BP of more than 135/85 mmHg and during sleep, more than 120/75 mmHg. The level of BP measurement by using ABPM correlates better than office measurements with target organ injury. ABPM also provides a measure of the percentage of BP readings that are elevated, the overall BP load, and the extent of BP reduction during sleep. In most individuals, BP decreases by 10 to 20 percent during the night; those in whom such reductions are not present are at increased risk for cardiovascular events.

  Clinical situations in which ABPM may be helpful:

  - Suspected white-coat hypertension in patients with hypertension and no target organ damage
  - Apparent drug resistance (office resistance)
  - Hypotensive symptoms with antihypertensive medication
  - Episodic hypertension
  - Autonomic dysfunction
- **Self-measurement of blood pressure**: BP self measurements may benefit patients by providing information on response to antihypertensive medication, improving patient adherence with therapy, and in evaluating white-coat hypertension. Persons with an average BP more than 135/85 mmHg measured at home are generally considered to be hypertensive. Home measurement devices should be checked regularly for accuracy.

Patient Evaluation

Evaluation of patients with documented hypertension has three objectives:

1. to assess lifestyle and identify other cardiovascular risk factors or concomitant disorders that may affect prognosis and guide treatment (see table 6 in the original guideline document)
2. to reveal identifiable causes of high BP (see table 7 in the original guideline document)
3. to assess the presence or absence of target organ damage and CVD

The data needed are acquired through medical history, physical examination, routine laboratory tests, and other diagnostic procedures.

- **Physical examination**: The physical examination should include an appropriate measurement of BP, with verification in the contralateral arm; examination of the optic fundi; calculation of BMI (measurement of waist circumference also may be useful); auscultation for carotid, abdominal, and femoral bruits; palpation of the thyroid gland; thorough examination of the heart and lungs; examination of the abdomen for enlarged kidneys, masses, and abnormal aortic pulsation; palpation of the lower extremities for edema and pulses; and neurological assessment.
- **Laboratory Tests and Other Diagnostic Procedures**: Routine laboratory tests recommended before initiating therapy include an electrocardiogram; urinalysis; blood glucose and hematocrit; serum potassium, creatinine (or the corresponding estimated glomerular filtration rate [GFR]), and calcium; and a lipid profile, after 9- to 12-hour fast, that includes high-density lipoprotein cholesterol (HDL) and low-density lipoprotein cholesterol (LDL), and triglycerides. Optional tests include measurement of urinary albumin excretion or albumin/creatinine ratio. More extensive testing for identifiable causes is not indicated generally unless BP control is not achieved. See the section Identifiable Causes of Hypertension in the original guideline document for a more thorough discussion.

Treatment

The ultimate public health goal of antihypertensive therapy is the reduction of cardiovascular and renal morbidity and mortality. Since most persons with hypertension, especially those age $\geq$50 years, will reach the DBP goal once SBP is at goal, the primary focus should be on achieving the SBP goal. Treating SBP and DBP to targets that are <140/90 mmHg is associated with a decrease in CVD complications. In patients with hypertension and diabetes or renal disease, the BP goal is <130/80 mmHg.

- **Lifestyle Modifications**: Adoption of healthy lifestyles by all persons is critical for the prevention of high BP and is an indispensable part of the management of those with hypertension. Major lifestyle modifications shown to lower BP include weight reduction in those individuals who are overweight or obese, adoption of the Dietary Approaches to Stop Hypertension (DASH) eating plan which is rich in potassium and calcium, dietary sodium reduction, physical activity, and moderation of alcohol consumption. See Table below.

  Table. Lifestyle Modifications to Manage Hypertension*@

  - Weight reduction: Maintain normal body weight (BMI, 18.5–24.9 kg/m^2)

    Approximate SBP Reduction, Range: 5–20 mmHg/10 kg weight loss

  - Adopt DASH eating plan: Consume a diet rich in fruits, vegetables, and low-fat dairy products with a reduced content of saturated and total fat.

    Approximate SBP Reduction, Range: 8–14 mmHg

- Dietary sodium reduction: Reduce dietary sodium intake to no more than 100 mmol per day (2.4 g sodium or 6 g sodium chloride)

  Approximate SBP Reduction, Range: 2–8 mmHg

- Physical activity: Engage in regular aerobic physical activity such as brisk walking (at least 30 min per day, most days of the week).

  Approximate SBP Reduction, Range: 4–9 mmHg

- Moderation of alcohol: Limit consumption to no more than 2 drinks (1 oz or 30 mL ethanol [e.g., 24 oz beer, 10 oz wine, or 3 oz 80-proof whiskey]) per day in most men and to no more than 1 drink per day in women and lighter weight persons.

  Approximate SBP Reduction, Range: 2–4 mmHg

* For overall cardiovascular risk reduction, stop smoking.

@The effects of implementing these modifications are dose and time dependent, and could be greater for some individuals.

- **Pharmacologic Treatment**: There are excellent clinical outcome trial data proving that lowering BP with several classes of drugs, including angiotensin converting enzyme inhibitors (ACEIs), angiotensin receptor blockers (ARBs), beta-blockers (BBs), calcium channel blockers (CCBs), and thiazide-type diuretics, will all reduce the complications of hypertension. Tables 10 and 11 in the original guideline document provide a list of commonly used antihypertensive agents and their usual dose range and frequency of administration.

  Thiazide-type diuretics should be used as initial therapy for most patients with hypertension, either alone or in combination with one of the other classes (ACEIs, ARBs, BBs, CCBs) demonstrated to be beneficial in randomized controlled outcome trials. The list of compelling indications requiring the use of other antihypertensive drugs as initial therapy is provided in Table 12 in the original guideline document. If a drug is not tolerated or is contraindicated, then one of the other classes proven to reduce cardiovascular events should be used instead.

- **Achieving Blood Pressure Control in Individual Patients**: Most patients who are hypertensive will require two or more antihypertensive medications to achieve their BP goals. Addition of a second drug from a different class should be initiated when use of a single drug in adequate doses fails to achieve the BP goal. When BP is more than 20/10 mmHg above goal, consideration should be given to initiating therapy with two drugs, either as separate prescriptions or in fixed-dose combinations. (See Figure 16 in the original guideline document.) The initiation of drug therapy with more than one agent may increase the likelihood of achieving the BP goal in a more timely fashion, but particular caution is advised in those at risk for orthostatic hypotension, such as patients with diabetes, autonomic dysfunction, and

some older persons. Use of generic drugs or combination drugs should be considered to reduce prescription costs.

Follow-up and Monitoring

Once antihypertensive drug therapy is initiated, most patients should return for follow-up and adjustment of medications at approximately monthly intervals until the BP goal is reached. More frequent visits will be necessary for patients with stage 2 hypertension or with complicating comorbid conditions. Serum potassium and creatinine should be monitored at least 1 to 2 times/year. After BP is at goal and stable, follow-up visits can usually be at 3- to 6-month intervals. Comorbidities, such as heart failure, associated diseases such as diabetes, and the need for laboratory tests influence the frequency of visits. Other cardiovascular risk factors should be treated to their respective goals, and tobacco avoidance should be promoted vigorously. Low-dose aspirin therapy should be considered only when BP is controlled, because the risk of hemorrhagic stroke is increased in patients with uncontrolled hypertension.

Special Considerations

The patient with hypertension and certain comorbidities requires special attention and follow-up by the clinician.

- **Compelling Indications**: Table 12 in the original guideline document describes compelling indications that require certain antihypertensive drug classes for high-risk conditions. The drug selections for these compelling indications are based on favorable outcome data from clinical trials. A combination of agents may be required. Other management considerations include medications already in use, tolerability, and desired BP targets. In many cases, specialist consultation may be indicated.
- **Ischemic Heart Disease**: Ischemic heart disease (IHD) is the most common form of target organ damage associated with hypertension. In patients with hypertension and stable angina pectoris, the first drug of choice is usually a BB; alternatively, long-acting CCBs can be used. In patients with acute coronary syndromes (unstable angina or myocardial infarction), hypertension should be treated initially with BBs and ACEIs, with addition of other drugs as needed for BP control. In patients with postmyocardial infarction, ACEIs, BBs, and aldosterone antagonists have proven to be most beneficial. Intensive lipid management and aspirin therapy are also indicated.
- **Heart Failure**: Heart failure (HF), in the form of systolic or diastolic ventricular dysfunction, results primarily from systolic hypertension and ischemic heart disease. Fastidious BP and cholesterol control are the primary preventive measures for those at high risk for heart failure. In asymptomatic individuals with demonstrable ventricular dysfunction, ACEIs and BBs are recommended. For those with symptomatic ventricular dysfunction or end-stage heart disease, ACEIs, BBs, ARBs and aldosterone blockers are recommended along with loop diuretics.
- **Diabetic Hypertension**: Combinations of two or more drugs are usually needed to achieve the target goal of <130/80 mmHg. Thiazide diuretics, BBs, ACEIs, ARBs, and CCBs are beneficial in reducing CVD and stroke incidence in patients with diabetes. ACEI- or ARB-based treatments favorably affect the

progression of diabetic nephropathy and reduce albuminuria, and ARBs have been shown to reduce progression to macroalbuminuria.

- **Chronic Kidney Disease**: In people with chronic kidney disease (CKD), as defined by either (1) reduced excretory function with an estimated GFR below 60 mL/min per 1.73 m^2 (corresponding approximately to a creatinine of >1.5 mg/dL in men or >1.3 mg/dL in women), or (2) the presence of albuminuria (>300 mg/day or 200 mg albumin/g creatinine), therapeutic goals are to slow deterioration of renal function and prevent CVD. Hypertension appears in the majority of these patients, and they should receive aggressive BP management, often with three or more drugs to reach target BP values of <130/80 mmHg. ACEIs and ARBs have demonstrated favorable effects on the progression of diabetic and nondiabetic renal disease. A limited rise in serum creatinine of as much as 35 percent above baseline with ACEIs or ARBs is acceptable and is not a reason to withhold treatment unless hyperkalemia develops. With advanced renal disease (estimated GFR <30 mL/min 1.73 m^2, corresponding to a serum creatinine of 2.5–3 mg/dL), increasing doses of loop diuretics are usually needed in combination with other drug classes.
- **Cerebrovascular Disease**: The risks and benefits of acute lowering of BP during an acute stroke are still unclear; control of BP at intermediate levels (approximately 160/100 mmHg) is appropriate until the condition has stabilized or improved. Recurrent stroke rates are lowered by the combination of an ACEI and thiazide-type diuretic.

Other Special Situations

- **Minority Populations**: BP control rates vary in minority populations and are lowest in Mexican Americans and Native Americans. In general, the treatment of hypertension is similar for all demographic groups, but socioeconomic factors and lifestyle may be important barriers to BP control in some minority patients. The prevalence, severity, and impact of hypertension are increased in African Americans, who also demonstrate somewhat reduced BP responses to monotherapy with BBs, ACEIs, or ARBs compared to diuretics or CCBs. These differential responses are largely eliminated by drug combinations that include adequate doses of a diuretic.
- **Obesity and the Metabolic Syndrome**: Obesity (BMI $\geq$30 kg/m2) is an increasingly prevalent risk factor for the development of hypertension and CVD. The Adult Treatment Panel III guideline for cholesterol management defines the metabolic syndrome as the presence of three or more of the following conditions: abdominal obesity (waist circumference >40 inches in men or >35 inches in women), glucose intolerance (fasting glucose $\geq$110 mg/dL), BP $\geq$130/85 mmHg, high triglycerides ($\geq$150 mg/dL), or low HDL (<40 mg/dL in men or <50 mg/dL in women). (See Table 13 in the original guideline document.) Intensive lifestyle modification should be pursued in all individuals with the metabolic syndrome (see Table 16 in the original guideline document), and appropriate drug therapy should be instituted for each of its components as indicated.
- **Left Ventricular Hypertrophy**: Left ventricular hypertrophy (LVH) is an independent risk factor that increases the risk of subsequent CVD. Regression of LVH occurs with aggressive BP management, including weight loss, sodium restriction, and treatment with all classes of antihypertensive agents except the direct vasodilators hydralazine and minoxidil.

- **Peripheral Arterial Disease**: Peripheral arterial disease (PAD) is equivalent in risk to ischemic heart disease (IHD). Any class of antihypertensive drugs can be used in most PAD patients. Other risk factors should be managed aggressively, and aspirin should be used. See Table 17 in the original guideline document.
- **Hypertension in Older Persons**: Hypertension occurs in more than two-thirds of individuals after age 65. This is also the population with the lowest rates of BP control. Treatment recommendations for older people with hypertension, including those who have isolated systolic hypertension, should follow the same principles outlined for the general care of hypertension. In many individuals, lower initial drug doses may be indicated to avoid symptoms; however, standard doses and multiple drugs are needed in the majority of older people to reach appropriate BP targets.
- **Postural Hypotension**: A decrease in standing SBP >10 mmHg, when associated with dizziness or fainting, is more frequent in older patients with systolic hypertension, diabetes, and those taking diuretics, venodilators (e.g., nitrates, alpha-blockers, and sildenafil-like drugs), and some psychotropic drugs. BP in these individuals should also be monitored in the upright position. Caution should be used to avoid volume depletion and excessively rapid dose titration of antihypertensive drugs.
- **Dementia**: Dementia and cognitive impairment occur more commonly in people with hypertension. Reduced progression of cognitive impairment may occur with effective antihypertensive therapy.
- **Hypertension in Women**: Oral contraceptives may increase BP, and the risk of hypertension increases with duration of use. Women taking oral contraceptives should have their BP checked regularly. Development of hypertension is a reason to consider other forms of contraception. In contrast, menopausal hormone therapy does not raise BP.

  Women with hypertension who become pregnant should be followed carefully because of increased risks to mother and fetus. See Table 19 in the original guideline document for classification of hypertension in pregnancy. Methyldopa, BBs, and vasodilators are preferred medications for the safety of the fetus. ACEIs and ARBs should not be used during pregnancy because of the potential for fetal defects and should be avoided in women who are likely to become pregnant. See Table 20 in the original guideline document for treatment of chronic hypertension in pregnancy. Preeclampsia, which occurs after the 20th week of pregnancy, is characterized by new-onset or worsening hypertension, albuminuria, and hyperuricemia, sometimes with coagulation abnormalities. In some patients, preeclampsia may develop into a hypertensive urgency or emergency and may require hospitalization, intensive monitoring, early fetal delivery, and parenteral antihypertensive and anticonvulsant therapy. See Table 21 in the original guideline document for treatment of acute severe hypertension in preeclampsia.

- **Hypertension in Children and Adolescents**: In children and adolescents, hypertension is defined as BP that is, on repeated measurement, at the 95th percentile or greater adjusted for age, height, and gender. The fifth Korotkoff sound is used to define DBP. Clinicians should be alert to the possibility of identifiable causes of hypertension in younger children (i.e., kidney disease, coarctation of the aorta). Lifestyle interventions are strongly recommended, with pharmacologic therapy instituted for higher levels of BP or if there is

insufficient response to lifestyle modifications. Choices of antihypertensive drugs are similar in children and adults, but effective doses for children are often smaller and should be adjusted carefully. ACEIs and ARBs should not be used in pregnant or sexually active girls. Uncomplicated hypertension should not be a reason to restrict children from participating in physical activities, particularly because long-term exercise may lower BP. Use of anabolic steroids should be strongly discouraged. Vigorous interventions also should be conducted for other existing modifiable risk factors (e.g., smoking).

- **Hypertensive Urgencies and Emergencies**: Patients with marked BP elevations and acute target-organ damage (e.g., encephalopathy, myocardial infarction, unstable angina, pulmonary edema, eclampsia, stroke, head trauma, life-threatening arterial bleeding, or aortic dissection) require hospitalization and parenteral drug therapy. Patients with markedly elevated BP but without acute target organ damage usually do not require hospitalization, but they should receive immediate combination oral antihypertensive therapy (see Table 23 in the original guideline document). They should be carefully evaluated and monitored for hypertension-induced heart and kidney damage and for identifiable causes of hypertension (see Table 7 in original guideline document).
- **Erectile Dysfunction and Hypertension**: Erectile dysfunction (ED), defined as the inability to have and maintain an erection adequate for intercourse, becomes increasingly common in men over 50 years old and is even more common if they are hypertensive. In a survey of over 3,000 health professionals, the frequency of ED was 4% in men under age 50, 26% in those 50 to 59, and 40% in those 60 to 69. The frequency was significantly higher if they were hypertensive, diabetic, obese, or smokers or were taking antidepressants or BBs.

  Whereas hypertension per se may be associated with ED, the use of various antihypertensive medications may increase the incidence, in part because BP lowering itself may cause reduction of perfusion of genital organs. Available data regarding individual effects of antihypertensive drug therapy are confounded by age, vascular disease, and hormonal status.

  A lower risk of ED was reported among men who were physically active, not obese, and nonsmokers. Therefore, lifestyle modifications should be encouraged to forestall ED. If ED appears after institution of antihypertensive drug therapy, the offending agent should be discontinued and treatment restarted with another agent. Sildenafil or other phosphodiesterase-5 inhibitors may be prescribed without a significant likelihood of adverse reactions in those with concomitant antihypertensive therapy so long as nitrates are avoided.

  There are no definitive data on a relation between sexual dysfunction and hypertension in women. Regardless of gender, clinicians should be willing to discuss sexual dysfunction problems and offer counseling to improve the patient´s quality of life.

- **Urinary Outflow Obstruction**: Symptoms of urinary outflow obstruction or a known history of obstruction should be elicited as part of the hypertension workup. When a normal bladder is distended beyond approximately 300 mL, sympathetic nervous system stimulation may cause a substantial increase in

BP. Patients with high spinal cord injuries in particular may exhibit large acute BP increases similar to individuals with autonomic dysfunction. BP control can be improved by keeping the bladder volume below 300 mL and by the use of sympatholytic drugs. Nonsurgical treatment of patients with urinary outflow obstruction includes the use of alpha$_1$-blockers such as terazosin, doxazosin, or prazosin, which indirectly dilate prostatic and urinary sphincter smooth muscle and also lower BP.

- **Patients Undergoing Surgery**: Uncontrolled hypertension is associated with wider fluctuations of BP during induction of anesthesia and intubation and may increase the risk for perioperative ischemic events. BP levels of 180/110 mm Hg or greater should be controlled prior to surgery. For elective surgery, effective BP control can be achieved over several days to weeks of outpatient treatment. In urgent situations, rapidly acting parenteral agents such as sodium nitroprusside, nicardipine, and labetalol can be utilized to attain effective control very rapidly.

  Surgical candidates with controlled hypertension should maintain their medications until the time of surgery, and therapy should be reinstated as soon as possible post-operatively. Adequate potassium supplementation should be provided, if needed, to correct hypokalemia well in advance of surgery. Older patients may gain particular benefit from treatment with beta$_1$-selective BBs before and during the perioperative period.

  Sudden intraoperative hypertension is managed by many of the same parenteral antihypertensive agents that are utilized in the management of hypertensive emergencies (see the section on emergencies and urgencies). Intravenous infusions of sodium nitroprusside, nicardipine, and labetalol can be effective. Nitroglycerin is often an agent of choice in patients with coronary ischemia, while the very short-acting BB esmolol may be of benefit in managing intraoperative tachycardia.

  Hypertension is very common in the early postoperative period, related to increased sympathetic tone and vascular resistance. Contributing factors include pain and increased intravascular volume, which may require parenteral dosing with a loop diuretic such as furosemide. If resumption of oral treatment must be interrupted postoperatively, periodic dosing with intravenous enalaprilat or transdermal clonidine hydrochloride may be useful.

- **Dental Issues in the Hypertensive Subjects**: A concern in dental care is the use of epinephrine in local anesthetic solutions. Many dental providers do not use catecholamine-containing local anesthetic formulations for any patient with elevated BP, as they are concerned with an adverse cardiovascular response. A systematic review of this topic concluded that, although adverse events may occur in uncontrolled hypertensive patients during dental procedures, the use of epinephrine had a minimal effect. BP should be monitored closely in the dental office if general anesthesia is administered to hypertensives because of potential wide fluctuations in BP and the risk of hypotension in those receiving antihypertensive drugs. CCBs and other vasodilators may cause hypertrophy of the gums.
- **Obstructive Sleep Apnea**: Obstructive sleep apnea (OSA) occurs in 2 to 4% of the adult population, and over 50% of individuals with OSA have hypertension. Obesity is so common in OSA that the index of suspicion for

OSA should be high in any hypertensive patient whose BMI is above 27 kg/m^2. These individuals should be questioned thoroughly for symptoms of OSA, including snoring, witnessed apnea, irregular breathing during sleep, restless sleeping, and chronic morning fatigue. Frequently it is the sleep partner who provides the most reliable history, especially regarding snoring, because the affected individual may deny or be unaware of the problem. If the diagnosis is suspected clinically, confirmation by a formal sleep study is indicated.

See the original guideline document for a discussion of the relationships between OSA, obesity, and hypertension.

In addition to weight loss, improvements in the quality of sleep in OSA patients can occur as a result of a variety of positioning measures during sleep, particularly sleeping on one´s side. Treatment with continuous positive airway pressure (CPAP) can be useful in overall BP lowering and may also improve cardiac ischemia and heart failure symptoms. The role of oral prostheses and surgical approaches remains to be fully defined. No specific class of antihypertensive drugs has yet been demonstrated to be superior for BP lowering in OSA patients.

- **Hypertension and the Eye**: Hypertension can affect the retina, choroid, and optic nerve of the eye, particularly with stage 2 hypertension. These changes can be appreciated with inspection of the retinal vessels by direct ophthalmoscopy, photography, or angiography.

  Hypertensive retinopathy is most commonly manifested by generalized or focal narrowing of retinal arterioles. In acute or advanced hypertension, the retinal vasculature may be injured sufficiently to cause occlusion or leakage. These changes may be manifested as nerve fiber layer infarcts (soft exudates or cotton-wool patches), extravascular edema (hard exudates), intraretinal hemorrhages, and retinal arterial macroaneurysms.

  Hypertensive choroidopathy is most frequently seen in young patients with acute hypertension, including cases of eclampsia or pheochromocytoma. Findings include Elschnig spots (nonperfused areas of the choriocapillaris) and Siegrist streaks (linear hyperpigmentation over choroidal arteries).

  Hypertensive optic neuropathy occurring with severe hypertension may present with flame hemorrhages, optic disc edema, venous congestion, and macular exudates.

- **Renal Transplantation**: Hypertension is a relatively common occurrence in patients receiving organ transplants; in those receiving kidney allografts, the prevalence of hypertension probably exceeds 65%. Nocturnal hypertension, a reversal of diurnal BP rhythm, may be present in these individuals who may need ABPM to evaluate overall BP control. Hypertension is less common in other forms of transplantation. The mechanisms of hypertension in transplant patients are multifactorial, but vasoconstriction and long-term vascular structural changes caused by chronic immunosuppressive drugs that are calcineurin inhibitors (cyclosporine and tacrolimus) and corticosteroids are among the most important. Impaired renal function is another exacerbating

factor; despite successful renal transplantation, most patients have enough impairment in renal function to cause relative salt and water retention. Transplant renal artery stenosis may also be a factor.

Observational studies suggest that hypertension correlates with deterioration in graft function. Large-scale, controlled clinical trials on the effects of BP control on GFR decline or on CVD incidence are lacking in this population. The high risk of graft occlusion and cardiovascular events has suggested that BP should be lowered to 130/80 mm Hg or less. Because of the absence of compelling data, no particular class of antihypertensives can be considered to be superior to any other. The difficulty of lowering BP in this group makes combination drugs necessary in almost all patients. As with other renal diseases, serum creatinine and potassium should be monitored 1 to 2 weeks following initiation or escalation in therapy with ACEIs or ARBs.

- **Patients with Renovascular Disease**: Hemodynamically significant renal artery stenosis may be associated with all stages of hypertension, but it is more commonly recognized in patients with stage 2 or resistant hypertension, since these are the individuals in whom special evaluation for the problem is carried out. If present bilaterally, renal artery stenosis can lead to reduced kidney function (ischemic nephropathy).

  Clinical clues to renovascular disease include (1) onset of hypertension before age 30 (especially without a family history) or recent onset of significant hypertension after age 55; (2) an abdominal bruit, particularly if it continues into diastole and is lateralized; (3) accelerated or resistant hypertension; (4) recurrent (flash) pulmonary edema; (5) renal failure of uncertain etiology, especially with a normal urinary sediment; (6) coexisting diffuse atherosclerotic vascular disease, especially in heavy smokers; or (7) acute renal failure precipitated by antihypertensive therapy, particularly ACEIs or ARBs.

  In patients with indications of renovascular disease, captopril-enhanced radionuclide renal scan, duplex Doppler flow studies, and magnetic resonance angiography may be used as noninvasive screening tests. Three-dimensional images can be obtained by spiral computed tomography, a technique that necessitates the use of intravenous contrast. Definitive diagnosis of renovascular disease requires renal angiography, which carries some risk, particularly of radiocontrast-induced acute renal failure or atheroembolism.

  In patients, usually women, with fibromuscular dysplasia, results of percutaneous transluminal renal angioplasty (PTRA) have been excellent and comparable to surgical revascularization. Patients with normal renal function and atherosclerotic renal artery stenosis that is focal, unilateral, and nonostial also may be managed by angioplasty. Renal artery stenting has become an important adjunct to PTRA, being used to counteract elastic recoil and to abolish the residual stenosis often observed after PTRA.

  Even though many patients with high-grade renal artery stenosis remain stable for prolonged periods if BP is well controlled, surgical revascularization or PTRA with renal artery stenting may be needed to preserve renal function.

Drugs and Other Agents Affecting Blood Pressure

Many prescription drugs and some over-the-counter agents and herbal supplements may affect BP and complicate BP control in treated hypertensives. Consequently, searching for the presence of these agents in the medical history can identify a secondary component contributing to BP elevation. Such recognition may negate the need to employ unnecessary and potentially hazardous testing.

Use of agents that can affect BP in a given patient should be suspected in the following situations: (1) loss of control of previously well-controlled hypertension, (2) presence of comorbidities (particularly osteoarthritis), (3) biochemical evidence of intercurrent drug usage (such as an increase in serum potassium or creatinine concentrations with nonsteroidal anti-inflammatory drugs), and (4) atypical hypertension (such as severe but transient hypertension in a young patient presenting with chest pain and electrocardiogram (ECG) changes accompanying possible cocaine usage).

Table 24 in the original guideline document provides a list of those agents that may alter BP. They may affect BP in several ways. They may affect sodium balance; increase adrenergic or suppress parasympathetic neural activity; alter the production, release, or effectiveness of vasoactive hormones; or exert direct effects on the endothelium or vascular smooth muscle.

Alcohol

Modest consumption of alcohol (e.g., <30 g of ethanol a day or approximately two drinks daily) is not generally associated with BP increases. Larger amounts of alcohol ingestion have a dose-related effect on BP, both in hypertensive and normotensive subjects. The use of ambulatory BP monitoring has highlighted the biphasic effects of alcohol on BP, underscoring the importance of the timing of BP measurement. A large intake of alcohol (>30 g) may lower BP in the first 4 hours after ingestion. Approximately 10 to 15 hours later (perhaps at the time a patient is seen for an office visit or in the emergency room during withdrawal), BP increase may be noted. This accounts for some of the discrepancies reported in the literature about alcohol´s effect on BP. The mechanism(s) of alcohol´s effect on BP are unclear but appear to result predominantly from sympathetic neural activation, although changes in cortisol and cellular calcium concentrations also may play a role.

Nonaspirin Nonsteroidal Anti-Inflammatory Drugs (NANSAIDs)

NANSAIDs represent one of the most common medication classes consumed by hypertensive patients. Among the NANSAIDs, older agents like indomethacin are the most extensively studied. BP responses vary within the class of the NANSAIDs; however, increases in pressure are often accompanied by peripheral edema and weight gain, supporting a salt-retention mechanism of hypertension associated with the loss of natriuretic prostaglandins such as PGE_2. Reduction in the well-described vasodilatory effects of some prostaglandins is another mechanism. COX-2 inhibitors also may cause elevation in BP. Recently, a double-blind randomized trial was conducted evaluating the effects of celecoxib, rofecoxib*, and naproxen on 24-hour BP in type 2 diabetic patients with osteoarthritis whose hypertension was treated with ACEIs or ARBs. At equally

efficacious doses for the management of osteoarthritis, treatment with rofecoxib*, but not celecoxib or naproxen, induced a significant increase in average 24-hour SBP in type 2 diabetic patients receiving ACEIs or angiotensin II receptor blockers. Thus, current data suggest that certain NSAIDs and COX 2 inhibitors may have destabilizing effects on BP control in diabetic hypertensive patients. This is a major concern, as diabetic patients are often older and obese, and both obesity and aging predispose to osteoarthritis as well as diabetes.

***Note from the National Guideline Clearinghouse (NGC)**: On September 30, 2004, Vioxx (rofecoxib) was withdrawn from the U.S. and worldwide market due to safety concerns of an increased risk of cardiovascular events. See the U.S. Food and Drug Administration (FDA) Web site for more information.

Improving Hypertension Control

Adherence to Regimens

Behavioral models suggest that the most effective therapy prescribed by the most careful clinician will control hypertension only if the patient is motivated to take the prescribed medication and to establish and maintain a health-promoting lifestyle. Motivation improves when patients have positive experiences with and trust in their clinicians. Empathy both builds trust and is a potent motivator.

Patient attitudes are greatly influenced by cultural differences, beliefs, and previous experiences with the health care system. These attitudes must be understood if the clinician is to build trust and increase communication with patients and families.

Failure to titrate or combine medications, despite knowing the patient is not at goal blood pressure (BP), represents clinical inertia and must be overcome. Decision support systems (i.e., electronic and paper), flow sheets, feedback reminders, and involvement of nurse clinicians and pharmacists can be helpful.

The clinician and the patient must agree upon BP goals. A patient-centered strategy to achieve the goal and an estimation of the time needed to reach goal are important. When BP is above goal, alterations in the plan should be documented. BP self-monitoring can also be useful.

Patients' nonadherence to therapy is increased by misunderstanding of the condition or treatment, denial of illness because of lack of symptoms or perception of drugs as symbols of ill health, lack of patient involvement in the care plan, or unexpected adverse effects of medications. The patient should be made to feel comfortable in telling the clinician all concerns and fears of unexpected or disturbing drug reactions.

The cost of medications and the complexity of care (i.e., transportation, patient difficulty with polypharmacy, difficulty in scheduling appointments, and life's competing demands) are additional barriers that must be overcome to achieve goal BP.

All members of the health care team (e.g., physicians, nurse case managers, and other nurses, physician assistants, pharmacists, dentists, registered dietitians, optometrists, and podiatrists) must work together to influence and reinforce instructions to improve patients' lifestyles and BP control.

Resistant Hypertension

Resistant hypertension is the failure to reach goal BP in patients who are adhering to full doses of an appropriate three-drug regimen that includes a diuretic. After excluding potential identifiable hypertension (see table 2 in the original guideline document), clinicians should carefully explore reasons why the patient is not at goal BP. (See table 18 in the original guideline document.) Particular attention should be paid to diuretic type and dose in relation to renal function. (See "Chronic Kidney Disease" section.) Consultation with a hypertension specialist should be considered if goal BP cannot be achieved.

CLINICAL ALGORITHM(S)

An algorithm is provided in the original guideline document for treatment of hypertension.

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The recommendations were based primarily on a comprehensive review of published reports. To provide information on the evidence category for articles used to prepare the guideline, classification grades (M, RA, RE, F, X, PR, C) are appended to the citations in the reference list in the original guideline document.

Evidence Classification

M

Meta-analysis; use of statistical methods to combine the results from clinical trials

RA

Randomized controlled trials; also known as experimental studies

RE

Retrospective analyses; also known as case-control studies

F

Prospective study; also known as cohort studies, including historical or prospective followup studies.

X

Cross-sectional survey; also known as prevalence studies

PR

Previous review or position statements

C

Clinical interventions (nonrandomized)

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Benefits of Lowering Blood Pressure

- In clinical trials, antihypertensive therapy has been associated with reductions in stroke incidence averaging 35 to 40 percent; myocardial infarction, 20 to 25 percent; and heart failure, more than 50 percent. It is estimated that in patients with stage 1 hypertension (systolic blood pressure [SBP] 140 to 159 mmHg and/or diastolic blood pressure [DBP] 90 to 99 mmHg) and additional cardiovascular risk factors, achieving a sustained 12 mmHg reduction in SBP over 10 years will prevent 1 death for every 11 patients treated. In the presence of cardiovascular disease or target organ damage, only 9 patients would require such BP reduction to prevent a death.
- Antihypertensive drugs can have favorable effects on other comorbidities:
    - Thiazide-type diuretics are useful in slowing demineralization in osteoporosis.
    - Beta blockers (BBs) can be useful in the treatment of atrial tachyarrhythmias/fibrillation, migraine, thyrotoxicosis (short term), essential tremor, or perioperative hypertension.
    - Calcium-channel blockers (CCBs) may be useful in Raynaud's syndrome and certain arrhythmias.
    - Alpha-blockers may be useful in prostatism.

POTENTIAL HARMS

Antihypertensive Drugs Can Have Unfavorable Effects on Other Comorbidities

- Thiazide diuretics should be used cautiously in patients who have gout or who have a history of significant hyponatremia.
- Beta-blockers should generally be avoided in individuals who have asthma, reactive airways disease, or second or third degree heart block.
- Angiotensin converting enzyme inhibitors (ACEIs) and angiotensin receptor blockers (ARBs) should not be given to women likely to become pregnant.
- ACEI-induced angioedema occurs 2 to 4 times more frequently in African American patients with hypertension than in other groups.
- Aldosterone antagonists and potassium-sparing diuretics can cause hyperkalemia and should generally be avoided in patients who have serum potassium values more than 5.0 mEq/L while not taking medications.

- The initiation of drug therapy with more than one agent may increase the likelihood of achieving the blood pressure goal in a more timely fashion, but particular caution is advised in those at risk for orthostatic hypotension, such as patients with diabetes, autonomic dysfunction, and some older persons.

Subgroups Most Likely to Be Harmed

Racial differences in incidence of antihypertensive drug side effects may occur; African Americans and Asians have a 3- to 4-fold higher risk of angioedema and have more cough attributed to ACEIs than whites.

CONTRAINDICATIONS

CONTRAINDICATIONS

Angiotensin converting enzyme inhibitors (ACEIs) and angiotensin receptor blockers are contraindicated in women who are pregnant. ACEIs should not be used in individuals with a history of angioedema.

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

In presenting these guidelines, the committee recognizes that the responsible physician's judgment remains paramount.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

To facilitate the application of the Seventh Report of the Joint National Committee (JNC 7), it will be published in two versions. A "JNC 7 Express" has been developed for busy clinicians. The longer version to be published later provides for a broader and more detailed review of the recommendations. Additional professional and patient education tools will support implementation of the JNC 7 recommendations.

IMPLEMENTATION TOOLS

Clinical Algorithm
Patient Resources
Personal Digital Assistant (PDA) Downloads
Tool Kits

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Living with Illness
Staying Healthy

IOM DOMAIN

Effectiveness
Patient-centeredness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, Jones DW, Materson BJ, Oparil S, Wright JT Jr, Roccella EJ. Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Hypertension 2003 Dec;42(6):1206-52. [386 references] PubMed

ADAPTATION

Not applicable: The guideline was not adapted from another source.

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Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC VI)

National High Blood Pressure Education Program (NHBPEP)

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

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The following author has stock holdings: Dr Izzo (Intercure, Nexcura).

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GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: The Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure. Bethesda (MD): U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Heart, Lung and Blood Institute; 1997 Nov. 33 p.

GUIDELINE AVAILABILITY

Electronic copies: Available from the National Heart, Lung, and Blood Institute (NHLBI) Web site.

Print copies: Available from NHLBI Information Center, P.O. Box 30105, Bethesda, MD 20824-0105; e-mail: nhlbiic@dgsys.com.

AVAILABILITY OF COMPANION DOCUMENTS

Various companion documents are available from the National Heart, Lung and Blood Institute Web site.

Print copies: Available from NHLBI Information Center, P.O. Box 30105, Bethesda, MD 20824-0105; e-mail: nhlbiic@dgsys.com.

Get With the Guidelines (GWTG) provides disease-specific process documents and tools for in-house quality improvement. See the American Heart Association Web site for more information.

See the following related QualityTool summaries on the Health Care Innovations Exchange Web site:

- Reference card from the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7)
- The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7): download application for Palm OS and PocketPC 2003
- The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7), slide show

PATIENT RESOURCES

The following are available:

- Your Guide to Lowering Blood Pressure. Bethesda (MD): U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Heart, Lung and Blood Institute, 2003 Mar. 20 p. Available in Portable Document Format (PDF) from the National Heart, Lung and Blood Institute (NHLBI) Web site. See the related QualityTool summary on the Health Care Innovations Exchange Web site
- The DASH Eating Plan. Bethesda (MD): U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Heart, Lung and Blood Institute, 1998 (revised 2003 May). 24 p. Available in Portable Document Format (PDF) from the NHLBI Web site.
- My blood pressure wallet card. Bethesda (MD): U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Heart, Lung and Blood Institute, 2003. 2 p. Available in Portable Document Format (PDF) from the National Heart, Lung and Blood Institute (NHLBI) Web site. See the related QualityTool summary on the Health Care Innovations Exchange Web site

Print copies: Available from NHLBI Information Center, P.O. Box 30105, Bethesda, MD 20824-0105; e-mail: nhlbiic@dgsys.com.

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